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RECREATION DEMAND AND RESOURCE SUPPLY
OF FUELWOOD ON THE FERMAN RANGER DISTRICT
IDAHO PANHANDLE NATIONAL FORESTS

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EXPERIMENT STATION

RECREATION DEMAND AND RESOURCE SUPPLY
OF FUELWOOD ON THE FERNAN RANGER DISTRICT
IDAHO PANHANDLE NATIONAL FORESTS



BY
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IDAHO PANHANDLE NATIONAL FORESTS
DECEMBER 1982

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Acknowledgment

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ABSTRACT

I developed procedures and gathered information to determine what factors motivated people to gather wood and to determine the recreation demand for the activity. I determined the origin of permit holders to define the regional area which contains over 412,000 people. Firewood collectors engage in the activity to be self reliant and save money on home heating bills and enjoy the physical exercise. Wood gathering has high utility value and demonstrates inelastic demand. Recreation demand for fuelwood will continue to increase to year 2000.

There are many competing uses for dead standing and down wood. The drain calculated for recreational fuelwood harvest alone will exceed projected supply in 1994 on the Fernan District. Other competing uses which currently are removing this wood resource are to fire boilers, for electrical generation, to produce paper and other wood projects and commercial fuelwood sales. There is growing concern and in some cases management direction to not enter wood producing areas which have high value for wildlife, fish, or recreation. Areas opened through roading are being closed post sale for the same and other reasons prohibiting the removal of fuelwood. With these additional drains and constraints the fuelwood supply on the Fernan District will be gone before 1990.

The Fernan District will be challenged to meet this demand to year 2000. New and innovative approaches must be developed, which include the removal of green trees for fuelwood, to increase supply to meet demand. This report raises questions concerning dead fuelwood supply of regional and national importance which must be addressed for the Forest Service to be successful in managing this resource for the future.

The procedures developed for this report may be applied by other public or private sector managers to determine fuelwood demand and total fuelwood supply for the lands they administer.

INTRODUCTION

Background - Until 1973, only those persons living within or in close proximity to a National Forest could receive a free use firewood permit. This policy was changed when Chief John R. McGuire announced a revised free use program which eliminated this requirement and made firewood available to all the public. The Fernan District issued 399 free use wood permits in 1973, at little administrative cost and fuelwood supply seemed to be unlimited. In 1980, the District issued 9,408 free use wood permits with management extremely concerned about lack of funding to administer the program and shrinking fuelwood supplies. District management options to shift funding, manpower and priorities to meet demand have disappeared.

The Fernan Ranger District is located in the panhandle of Idaho, is comprised of 354,000 acres and serves over 400,000 people within the defined regional area in northern Idaho and eastern Washington.

The number of firewood permits issued by the District in 1980 represented one percent of those issued nationally, 15.3 percent of those issued in Region One, and 60.5 percent of those issued on the Idaho Panhandle National Forests. Permits issued by the District represent 11.6 percent of the total number issued by the Forest Service in Idaho.

Regional area permit holders removed an average of 5.8 cords each totaling 54,566 cords of wood in 1980, or 27,283,200 board foot volume. Calculations of fuelwood supply for the District indicate fuelwood is being removed faster than replacement deadwood or road access to new areas is created.

Woodgatherers are voicing concern over the growing scarcity of dead fuelwood and complain about the illegal activities of some woodcutters. They dislike the growing competition for good firewood between themselves and other free use woodcutters and other competing demands for fuelwood to produce electricity and wood products from deadwood.

District management is concerned with being able to retain in place enough deadwood to meet wildlife and fish habitat needs and still meet projected fuelwood demand. Of particular concern are road closures to protect elk from vehicle disturbance while on their summer range. These areas when closed could be unavailable for fuelwood collection for from 10 to 20 years. Other concerns are the lack of management direction, policy and funding to deal with the total problem of managing the deadwood resource in the face of many competing uses.

Woodgathering provides the opportunity for participants to experience recreation outcomes they seek while saving money in home heating bills ^{1/}. Gathering fuelwood has high attraction because the activity satisfies a wide range of needs for which there are few substitutes at the cost and the enjoyable experiences extend well beyond the physical process of wood collection.

^{1/} Dependent upon the break-even point as calculated for each woodgatherer discussed later in the paper.

Studies indicate the cost of conventional heating will continue to increase resulting in a rising demand for fuelwood as an alternate energy source and recreational activity.

Objective - The first objective of this report is to document my research of resource supply and recreational consumer demand for fuelwood on the Fernan Ranger District. The second objective is to call attention to the fundamental issues of supply, demand and competing uses associated with fuelwood resource management. This report raises more questions than answers which must be addressed by management at higher levels to develop a fuelwood policy that is responsive to demand and consistent with supply.

Approach - I obtained information to construct a profile of a typical woodgatherer by contacting 43 forest users engaged in the activity at supply areas on the District who were asked questions concerning their collecting behavior and motivation. This information along with research of existing literature on firewood collecting; use of District statistical records of free use wood permits issued; Bureau of Census 1980 reports; and County planning population projections were used to establish the regional area and project demand. I used existing research and reports; Forest Timber Management Plan data; District statistical records on road access and the typical woodgatherer's profile to quantify and project fuelwood supply. Assumptions were made to fill-in data where only partial information existed. I consulted other district or forest personnel when assumptions or data required verification by a specialist outside my field.

ANALYSIS

Typical Woodgatherer's Profile - The typical woodgatherer on the Fernan District is a male who begins cutting wood in June, makes 6.5 trips to collect 5.8 cords of larch, travels 35 miles one way to the collection site, and is willing to drive an additional 21 miles one way to engage in the activity. He enjoys a minimum of one other recreational activity while in the woods, primarily berry picking, and is motivated to collect wood to get the physical exercise and to be self-reliant, and burns the wood to heat his home. Forty-four percent are willing to cut green wood. Some have a storing and curing problem at home. He is willing to pay \$1.00 per cord for his wood, but wants to see services improved in maps provided, signing, access to wood areas, yarding wood to roads and law enforcement. His concerns are a decreasing wood supply, illegal cutting activities, and too many woodcutters. (Appendix 1)

Regional Area - The regional area served by the Fernan Ranger District was determined by randomly sampling 2,981 of the 9,408 wood permits issued in 1980 to establish the origin of the permit holder. The area incorporates Kootenai County, Idaho and Spokane County, Washington, and portions of Shoshone, Benewah, and Bonner Counties, Idaho, and Pend Oreille, Stevens, and Whitman Counties, Washington.

I divided the regional area into six travel zones for analysis purposes. Each zone is based on the number of miles a woodgatherer travels to engage in the wood cutting activity (figure 1).

The number of people living in the defined regional area was determined by using advance reports from the 1980 census ^{1/}. Table 1 summarizes the population and number of free use permit holders by travel zone within the regional area. The total number of permits issued by zone (column 4) was extrapolated from the random sample based on percentage of permit occurrence in that zone.

Table 1 - Population, Number of Permits, One-Way Travel Distance and Percent of Population Holding Permits by Zone

Zone	Distance	Population	No. of Permits	Percent of Population Holding Permits
I	10-20 miles	33,834	3,728	11.02
II	20-30 miles	19,061	1,635	8.58
III	30-40 miles	16,695	611	3.66
IV	40-50 miles	288,985	3,254	1.13
V	50-60 miles	33,215	121	.36
VI	60-70 miles	20,746	32	.15
	70+ miles	2/	27	2/
		412,536	9,408	

^{2/}No population figures were recorded beyond the defined regional area

^{1/} U.S. Department of Commerce

IDAHO PANHANDLE NATIONAL FORESTS

Area of Influence

CANADA

Bannock Ferry
Sandpoint
Priest River
Coeur d'Alene
SPOKANE
Kellie
Wallace
St. Maries

WASHINGTON

Missoula

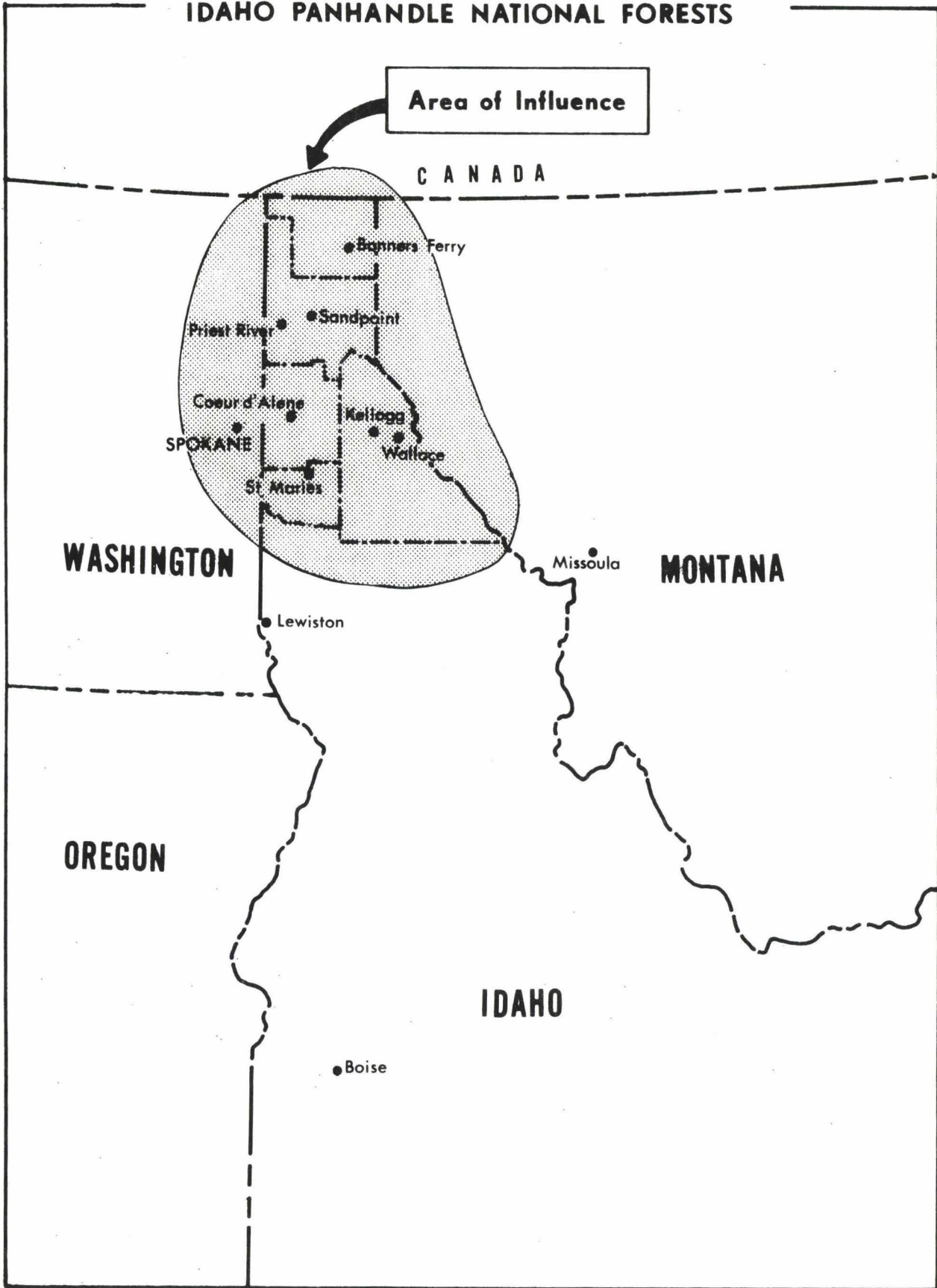
MONTANA

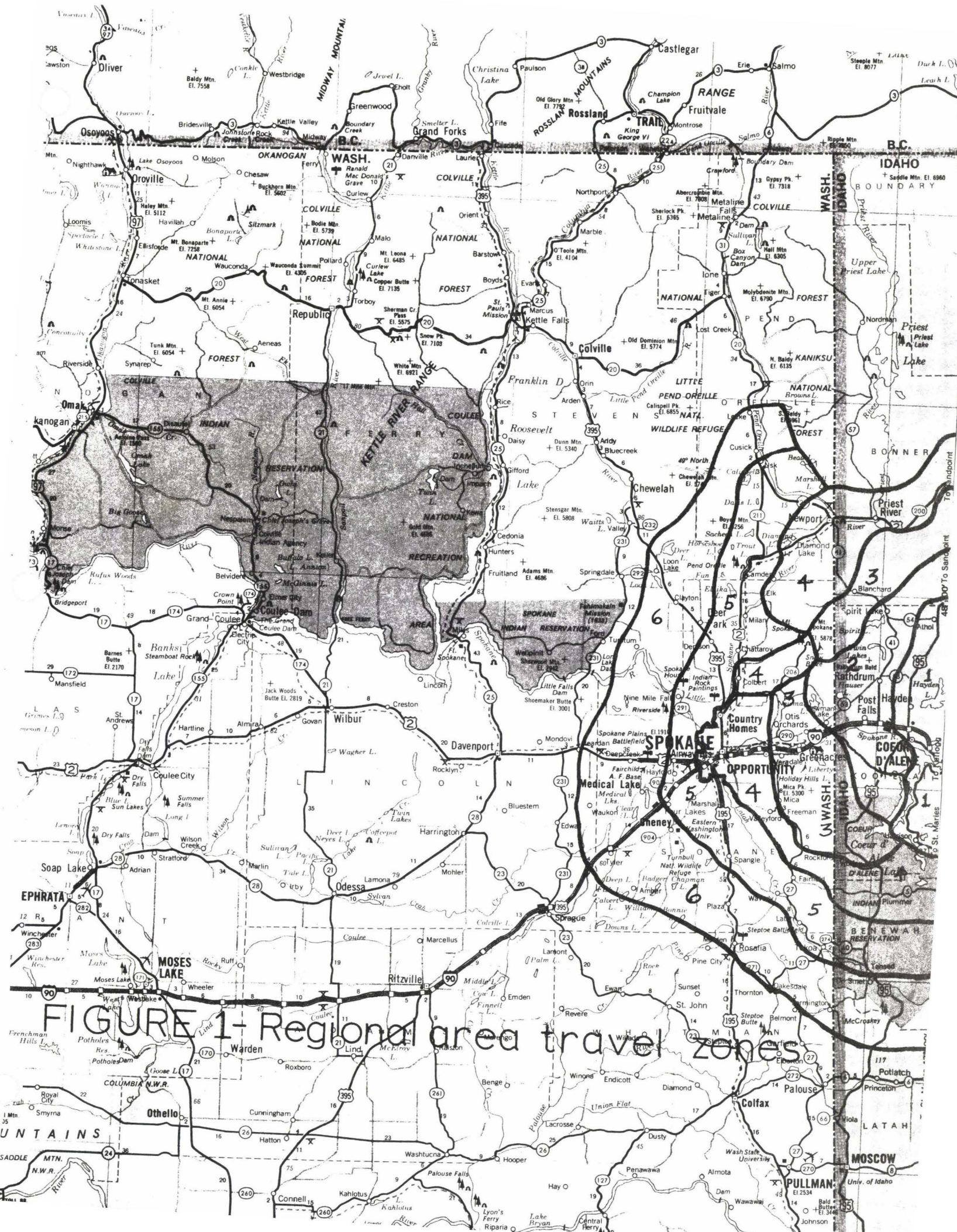
Lewiston

OREGON

IDAHO

Boise





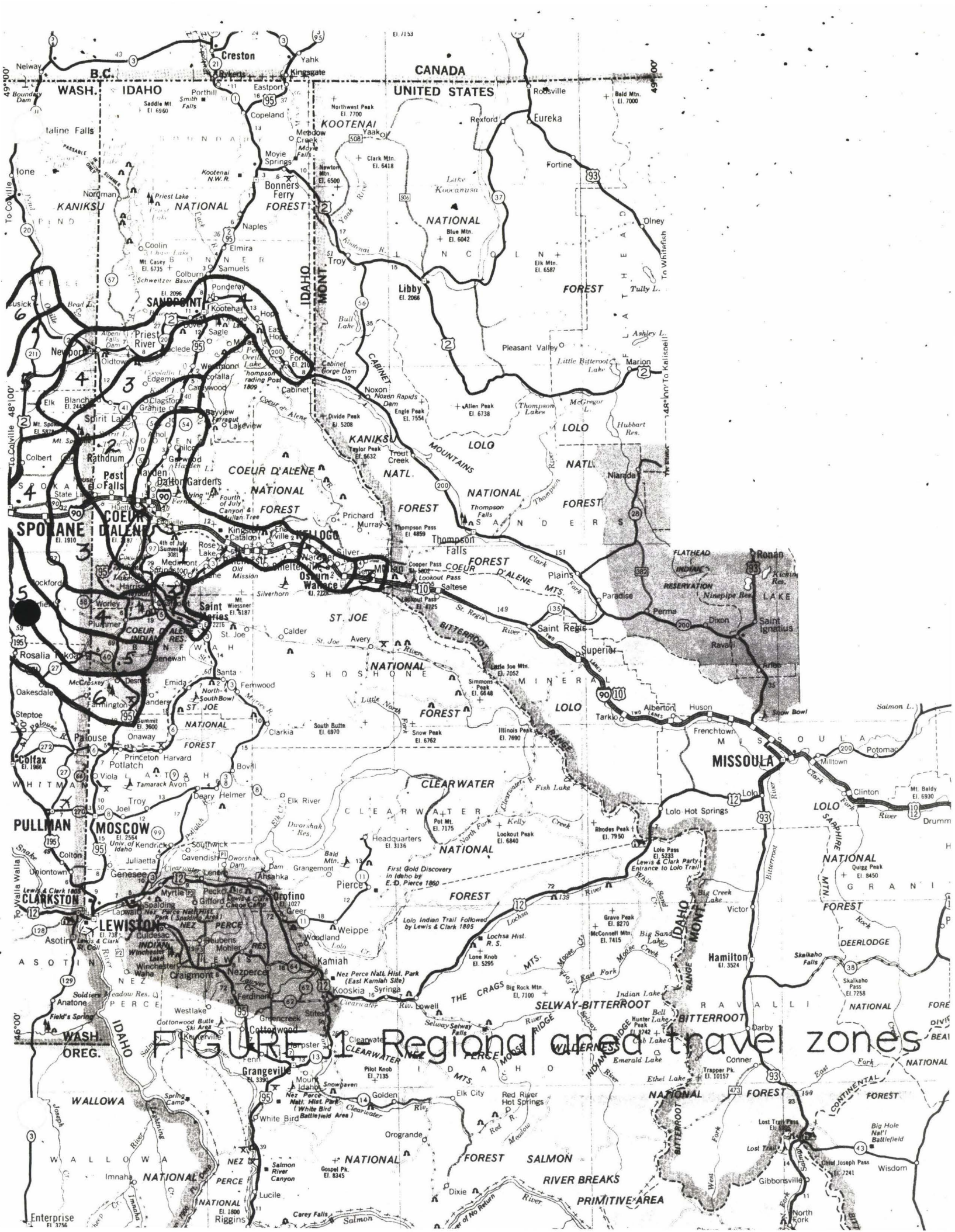


FIGURE 31 Regional area travel zones

Fuelwood Demand - The demand for fuelwood is driven by the desire to save money by heating with wood instead of conventional fuels (economics) and the desire to engage in woodcutting activity to satisfy basic recreation needs (utility). There is a direct relationship between demand for recreation activity and its cost. When the cost reaches or exceeds the utility value as perceived by a wood gatherer, substitution of other recreational activities having greater utility value will take place.

Firewood Economics - Determining the economics of fuelwood gathering has been evaluated and quantified by other researchers ^{1/}. Hanley presents a number of formulas to determine cost efficiency of fuelwood heating. The basic question that must be answered is, how far can a fuelwood gatherer drive and break even on home heating bills. The following assumptions are made to characterize the typical woodgatherer in order to calculate break even and surplus values by zone:

- a. Drives a 3/4-ton pickup truck with 3/4-cord capacity and wood hauling represents 50 percent of the need to own the truck.
- b. The truck consumes one gallon of gas per 10 miles traveled.
- c. Cost of gasoline is \$1.40 per gallon.
- d. Wood is burned in an airtight stove with 40 percent heat yield efficiency.
- e. Labor costs are not considered and assumed to be recreation and free.

These assumptions are used to calculate the costs and benefits for home heating with wood as presented by Hanley.

The analysis is divided into fixed and variable costs with fixed costs constrained no matter what zone the wood gatherer resides in and variable costs which differ by zone. Fixed costs for this evaluation consist of vehicle, stove and chain saw purchase and maintenance. The variable cost is the amount of fuel used in transporting wood.

Fixed Cost per Cord

1. Purchasing and maintaining a used 3/4-ton pickup truck with a life expectancy of 10 years. Licenses, title, registration and taxes included in purchase price. Hauling 6 cords of wood/year.

Purchase price	\$1,000.00
Maintenance	800.00
Trade-in value	<u>-300.00</u>
	\$1,500.00

$$\left[\frac{(\$1500 \times .50)}{10} \right] \div 6 = \$12.50 \text{ per cord}$$

^{1/} Don Hanley, 1980 and 1981

Cost of Conventional Fuels

The next step is to determine the cost of conventional fuels in thousand British Thermal Units (MBTU's) and the amount of MBTU's heat yield contained in wood used in the regional area. From this data, the break even value can be calculated by zone for conventional fuels replaced by wood heat.

I determined the cost of conventional heat by contacting venders in the regional area who quoted the prices shown in Table 3.

Table 3 - Cost of Conventional Heat in Regional Area in Thousand British Thermal Units (MBTU's)

	#2 Heating Oil	Propane	Electricity	Natural Gas
MBTU Cost	.0115	.0096	.0091 <u>1/</u>	.0067

1/ Based on over 13,000 KW per month use. Rate will increase with less consumption

Fuelwood Heat Value

Fuelwood heat values vary by species of wood. Considerable research has been completed quantifying the heat yield in MBTU's by species. I used the same data as Burke 2/ in preparing Table 4 which indicates the heat yield in MBTU's per cord for the primary wood species used in the regional area by the typical wood gatherer.

Table 4 - MBTU Heat Yield per Cord for Fuelwood From the Regional Area

Species	Wt. Lbs.	BTU/Lb.	Stove Efficiency	MBTU's Yield
Larch	3,330	7,820	.40	10,322
Dougals-fir	2,900	7,820	.40	9,070
Lodgepole pine <u>3/</u>	2,637	7,310	.40	7,710

3/ Ponderosa pine, grand fir, hemlock, and white pine are close in heat yield to lodgepole pine.

2/ Edwin J. Burke, 1979

Break Even Value

The dollar value of a cord of wood obtained in the regional area to replace a conventional fuel can now be calculated. This dollar value is the amount you could pay for the wood if purchased, or spend to obtain the wood yourself and break even. The break even values per cord by wood species are shown in Table 5 where BEV = cost (Table 3) x MBTU's (Table 4).

Table 5 - Break Even Value by Wood Species per Cord to Replace Conventional Fuels in the Regional Area

Larch				Douglas-fir				Lodgepole pine			
#2 Heat- ing Oil	Prop.	Elect.	N.G.	#2 Heat- ing Oil	Prop.	Elect.	N.G.	#2 Heat- ing Oil	Prop.	Elect.	N.G.
\$118.70	99.09	93.93	69.17	\$104.31	87.07	82.54	60.77	\$88.67	74.02	70.16	51.66

Maximum Round Trip Miles

The maximum round trip miles a typical wood gatherer can travel and still break even is dependent on the species of wood burned and the conventional heat source replaced with that wood. The maximum round trip miles are displayed in Table 6 where the break even value (Table 5) minus the fixed cost per cord (Table 2) times .75cords hauled per trip divided by .14 cost per mile = maximum round trip miles/cord.

Table 6 - Maximum Round Trip Miles for the Typical Wood Gatherer to Break Even With Wood Replacing Conventional Fuel in the Regional Area

Larch				Douglas-fir				Lodgepole pine			
-----				Break Even Round Trip Miles				-----			
Oil	Prop.	Elect.	N.G.	Oil	Prop.	Elect.	N.G.	Oil	Prop.	Elect.	N.G.
451	346	318	186	374	282	257	141	290	212	191	92

Surplus Value

The surplus value by zone is the difference in dollar cost between the total cost/cord for the zone (Table 2) minus the break even value for wood replacing the conventional fuel (Table 5)

Table 7 - Surplus Value in Dollars/Cord by Zone for the Typical Wood Gatherer Replacing Conventional Fuel With Wood in the Regional Area

Zone	<u>Larch</u>				<u>Douglas-fir</u>				<u>Lodgepole pine</u>			
	Oil	Prop.	Elect.	N.G.	Oil	Prop.	Elect.	N.G.	Oil	Prop.	Elect.	N.G.
I	77	57	52	27	62	45	41	19	47	32	28	10
II	73	53	48	23	57	41	37	15	43	28	24	6
III	69	50	45	20	55	38	33	11	39	25	21	2
IV	66	46	41	16	51	34	29	8	35	21	17	-1
V	62	42	37	12	47	30	26	4	32	17	13	-5
VI	58	38	33	8	44	26	22	0	28	13	9	-9

From Table 7, it is apparent the typical wood gatherer in the regional area is realizing a significant savings (surplus value) by using wood to replace conventional heat in all zones except when substituting lodgepole pine for natural gas in Zones IV, V, and VI.

Resource Value

The value wood gatherers receive after costs is the resource value. Table 8 shows the resource value of wood gathering for the regional area calculated using surplus value figures from Table 7 for an equal mixture of larch, Douglas-fir and lodgepole pine replacing electric heat.

The resource value for replacing propane and oil heat with the same mix of wood will be higher and replacing natural gas with the same mix will be lower.

Table 8 1/ - Annual Resource Value of Wood Gathering in the Regional Area to Replace Electric Heat With a Mixture of Larch, Douglas-fir and Lodgepole Pine

1	2	3	4	5	6	7	8	9
Zone	Distance (Miles)	Cost/Cord (Dollars)	No. of Cords Cut	Total Value (Dollars)	Total Cost (Dollars)	Surplus Value (Dollars)	Permit Holders	Total Resource Value (Dollars)
I	40	41.91	6.167	507.20	258.46	248.74	3,728	927,302
II	60	45.70	5.907	484.57	269.95	214.62	1,635	350,904
III	80	49.43	5.647	465.48	279.13	186.35	611	113,860
IV	100	53.13	5.386	442.35	286.16	156.19	3,254	508,242
V	120	56.90	5.127	421.61	291.73	129.88	121	15,715
VI	140	60.63	4.867	398.97	295.09	103.83	32	3,323
Total - - - - -								\$1,919,346

1/ Explanation of columns in Table 8 using Zone I as an example.

- (1) Column 1 (Table 8) = column 1 (Table 2)
- (2) Column 2 (Table 8) = column 2 (Table 2)
- (3) Column 3 (Table 8) = column 5 (Table 2)
- (4) Column 4 = interpolation of research data on volume cut/wood gatherer from Zones I and IV (Appendix 1)
- (5) Column 5 = column 6 + column 7 = \$258.46 + \$248.74 = \$507.20
- (6) Column 6 = column 3 x column 4 = \$41.91 x 6.167 = \$258.46
- (7) Column 7 = column 5 - column 6 = \$507.20 - \$258.46 = \$248.74
- (8) Column 8 (Table 8) = column 4 (Table 1)
- (9) Column 9 = column 7 x column 8 = \$248.74 x 3,728 = \$927,302

The large surplus value (column 7, Table 8) indicated for each zone is significant because it represents how much more the typical wood gatherer should be willing to pay based only on the economics of the activity. In other words, wood gathering has high consumer value and participation in the activity will continue until costs incurred equal value received.

Recreation Demand

Wood gatherers surveyed indicated collecting firewood was an enjoyable physical experience, however, the motivation for collecting firewood is to save money. Wood gatherers are eager to spend their own time and energy in the physical process of gathering, loading, splitting, storing and burning wood to satisfy recreational needs at a profit. In addition, other recreational activities are engaged in by woodcutters when they are in the woods, free of charge, as long as a break even quantity of wood is brought home. Responses from 43 Zone I and IV woodcutters when asked what other activities they engaged in while cutting wood indicated berry picking (42 percent) and observing nature (33 percent) were the most popular. When asked what they enjoyed about the woodcutting activity itself, they indicated the physical exercise (32 percent)

and feeling of being self reliant (27 percent) were most important. Other needs being satisfied by the wood gathering activity in order of importance were getting away from people (19 percent), enjoying a family outing (12 percent), and being with friends (10 percent). (Appendix 1)

All the recreation needs now being satisfied by wood gathering could be fulfilled by a variety of other activities available within the regional area, however, substitution will not take place until the attraction of saving money approaches the break even value for the individual engaged in the activity. Studies indicate the price of conventional home heating will continue to climb to the year 2000 1/. Wood gathering will become more popular in future years as the spread widens between cost to engage in the activity and its utility value.

Demand Projections - Projecting demand for fuelwood requires examination of the interaction between 1) the internal factors or personality of the wood gatherer, 2) the intermediate factors of time and cost to engage in the activity and 3) the external factors of fuelwood supply and its management. The more factors measured the better the demand projection.

Examination of the internal and intermediate factors for the typical wood gatherer in the regional area indicate the utility value received by engaging in the activity is high (Table 7) with no existing substitute activities at the cost. All indications are cost of conventional heating will continue to rise more sharply than the costs of collecting wood 1/ 2/ demonstrating inelastic 3/ demand. Examination of external factors of resource supply and fuelwood management policy indicate sufficient fuelwood supply exists under management to meet demand and current Forest Service direction emphasizes providing energy saving recreation activities for the public. The Record of Decision signed December 4, 1981 by Chief R. Max Peterson filed for the final Environmental Impact Statement for the Northern Region, USDA, Forest Service which states under Energy Resource Issue: Firewood, "How can the Region's Forests best manage the rapid expansion in firewood cutting?"

"The Region will establish guidelines to accommodate the use of firewood."

The Idaho Panhandle National Forests is currently developing Forest policy that will direct ranger districts to develop fuelwood management plans for their units.

1/ Northwest Energy Policy Project, 1978

2/ Idaho State Energy Plan, 1981

3/ Costs must raise sharply before substitution of a different recreation activity will take place.

I believe the majority of homeowners in the regional area that desire to collect their own wood to satisfy recreational needs are now doing so. This assumption is supported by only a slight increase in permits issued in 1981 (75) over those issued in 1980. It is further supported by the fact that new wood stove sales in 1981 increased over 1980 sales in the regional area. 1/

A relative balance has been reached in the existing population between new people entering the activity and those dropping out with future increases in demand directly proportional to the increase in population for the regional area.

The percentage of population now holding permits (Table 1), regional growth estimates and demand projections for 1990 and 2000 are displayed in Table 9.

1/ Data from personal contact with wood stove sales outlets in the regional area.

Table 9 1/ - Population and Number of Permits for 1980 Projected to 1990 and 2000
Using County Growth Estimates of .5153 2/ for Zones I, II and III and
.4013 3/ for Zones IV, V, and VI.

Zone	1980			1990		2000	
	Population	No. of Permits	Percent of Population Holding Permits	Population Estimate	Projected No. of Permits	Population Estimate	Projected No. of Permits
I	33,834	3,728	.1102	42,551	4,689	51,269	5,650
II	19,061	1,635	.0858	23,972	2,057	28,883	2,478
III	16,965	611	.0360	21,336	768	25,707	925
IV	288,985	3,254	.0113	346,970	3,921	404,955	4,576
V	33,215	121	.0036	39,879	144	46,544	168
VI	20,746	32	.0015	24,908	37	29,071	44
	<u>412,536</u>	<u>9,381</u>		<u>499,616</u>	<u>11,616</u>	<u>586,429</u>	<u>13,841</u>

1/ Assumes a balance between people starting in the activity of wood cutting and those dropping out for the population examined for the next 20 years.

2/ Data obtained from Kootenai County, Idaho.

3/ Data obtained from Spokane County, Washington

The permit projections from Table 9 were used to build Table 10 which displays the estimated number of permits and cord volume needed per year to meet demand for the next 20 years. This information will be used to compare with fuelwood supply projections developed later in this paper and is essential for planning sustained yield to meet demand.

Table 10 - Estimated Number of Permits and Cord Volume Needed to Meet Demand to the Year 2000 for the Regional Area

Year	No. of Permits	Volume (Cords)	Cumulative	Year	No. of Permits	Volume (Cords)	Cumulative
			Volume (Cords)				Volume (Cords)
1981	9,604	57,624	113,910 <u>1/</u>	1991	11,838	71,028	763,911
1982	9,828	58,971	172,881	1992	12,061	72,366	836,277
1983	10,051	60,306	233,187	1993	12,283	73,698	909,975
1984	10,275	61,650	294,837	1994	12,506	75,036	985,011
1985	10,498	62,988	357,825	1995	12,728	76,368	1,061,379
1986	10,722	64,332	422,157	1996	12,951	77,706	1,139,085
1987	10,945	65,670	487,827	1997	13,174	79,044	1,218,129
1988	11,168	67,008	554,835	1998	13,396	80,376	1,298,505
1989	11,392	68,352	623,187	1999	13,619	81,714	1,380,219
1990	11,616	69,696	692,883	2000	13,841	83,046	1,463,265

1/ Includes 56,286 cords removed in 1980

FUELWOOD SUPPLY

Fuelwood for the purposes of this report is dead wood that occurs adjacent to roads as down sound material which has accumulated over a long period of time (reserve) and what is added to the reserve annually through tree mortality (recruitment).

Reserve fuelwood supplies have been depleted from accessible acres next to forest roads closest to forest entry points. The volumes of reserve and recruitment vary by forest cover type and stand age class. Stand tending through timber sales along forest roads has improved stand conditions and reduced recruitment of dead fuelwood from these acres. Only a portion of the total acres on the Fernan District has fuelwood reserves and recruitment potential and some acres that have potential are inoperable or closed to the activity.

I determined existing and projected future fuelwood supply for the Fernan Ranger District by using existing research for the Idaho Panhandle National Forests which quantifies down fuelwood loading 1/ (reserve) and Idaho Panhandle National Forests Timber Management Plan data which quantifies mortality by age class and habitat type (recruitment) and the following assumptions:

Assumption One - As of 1980, 60 percent of the fuelwood reserve in gathering area 1, and 15 percent in area 2 have been removed by gatherers while the reserve in areas 3 and 4 has not been affected yet.

Assumption Two - That the existing road systems on the District access all forest cover types proportionally to their occurrence on the District and these types contain uniform distribution of age classes from 30 to 160 years. Old growth stands 160 years and older have been removed by regeneration cuts.

Assumption Three - That 50 percent of roadside timber stands have had stand tending to date that has improved stand conditions and reduced annual mortality (recruitment) and stand tending in the remaining roadside stands will continue to take place at the rate of 2 percent per year for the next 20 year period.

Assumption Four - That the existing road systems on the District access fuelwood producing, nonproducing, inoperable and closed acres proportionally to their occurrence on the District with 70 percent accessing fuelwood producing and 30 percent 2/ accessing nonproducing, inoperable or closed acres.

Assumption Five - Fuelwood gatherers collect all their fuelwood from the large (greater than 3-inch) component of down woody material in a zone 400 feet wide adjacent to forest roads.

Assumption Six - That 15 percent of annual mortality (recruitment) volume is crumbly rot and unusable for firewood.

1/ Brown, J.K, and See, T.E., 1981

2/ The percentage of nonproducing, inoperable and closed acres was determined using 1978 FINSYS data for the Fernan District.

Sound Down Fuelwood (Reserve)

Reserve volume calculations were made from existing research data on down woody fuel loading by cover type for the Idaho Panhandle National Forests 1/. Table 11 displays the total down woody fuel loadings by cover type. The information is presented to show total biomass from which the sound fuelwood component must be separated.

Table 11 - Down Fuelwood Loading by Cover Type for the Idaho Panhandle National Forests

		- - - - -Tons/Acre- - - - -								
Cover Type*	Rotten Percent	0.25 to 3 inches			3 inches and larger			Total		
		Mean	Sound	Rotten	Mean	Sound	Rotten	Mean	Sound	Rotten
PP	53	2.9	1.3	1.6	12.3	5.8	6.5	15.2	7.1	8.1
DF	53	4.2	2.0	2.2	16.0	7.5	8.5	20.2	9.5	10.7
LP	49	4.0	2.0	2.0	14.3	7.3	7.0	18.3	9.3	9.0
L	62	4.4	1.7	2.7	28.2	10.7	17.5	32.6	12.4	20.2
S-F	52	3.9	1.8	2.1	29.5	14.2	15.3	33.4	16.0	17.4
C-H	55	4.2	1.9	2.3	34.3	15.4	18.9	38.5	17.3	21.2
WP	54	3.5	1.6	1.9	20.0	9.2	10.8	23.5	10.8	12.7

*PP = Ponderosa pine

DF = Douglas-fir

LP = Lodgepole pine

L = Western larch-grand fir

S-F = Engelmann spruce-subalpine fir

C-H = Western redcedar-western hemlock

WP = Western white pine

1/ Brown, J.K, and See, T.E., 1981

Research by Harvey, Jurgensen and Larsen ^{1/} indicates it is desirable to retain ten tons per acre of woody material on site for ecosystem needs. All cover types on the Idaho Panhandle National Forests except the ponderosa pine type have sufficient quantities of down woody and rotten material left after removal of the sound fuelwood component to meet this need. Management should consider leaving .6 tons per acre of the large sound fuelwood component in the ponderosa pine cover type to meet ecosystem needs.

Table 12 displays the allocation of down woody fuel for ecosystem needs and sound woody material available for fuelwood gathering by cover type for the Idaho Panhandle National Forests. All of the 0.25 to 3 inch down woody fuel (assumption five) and all of the larger than 3 inch rotten component are allocated to ecosystem needs leaving the excess large sound woody material for wood gatherers.

Table 12 - Allocation of Down Woody Material for Ecosystem Needs and Excess Large Sound Woody Material

Cover Type	0.25 to 3 inches (Tons/Acre)	Large Rotten (Tons/Acre)	Ecosystem Allocation (Tons/Acre)	Large Sound (Tons/Acre)	Excess Large Sound (Tons/Acre)
PP	2.9	6.5	9.4	5.8	5.2 ^{1/}
DF	4.2	8.5	12.7	7.5	7.5
LP	4.0	7.0	11.0	7.3	7.3
L	4.4	17.5	21.9	10.7	10.7
S-F	3.9	15.3	19.2	14.2	14.2
C-H	4.2	18.9	23.1	15.4	15.4
WP	3.5	10.8	14.3	9.2	9.2
Mean					9.9 ^{2/}

^{1/} .6 tons/acre subtracted from large sound component to meet the 10 tons per acre requirement for ecosystem needs in the PP cover type.

^{2/} Assumption two is applied to determine the mean tons per acre of sound down (reserve) fuelwood.

^{1/} Harvey, A.E., Jurgensen, M.F., and Larsen, M.J., 1979

The excess sound woody material in tons per acre is converted to cord volume per acre using formula No. 1.

Formula 1

$$V = \frac{(W \div D)}{E}$$

Where:

V = Volume, cords/acre/year

W = Weight (excess sound woody material, Table 12) lbs/acre

D = Density, lbs/ft³ (sound material at 19.5 lbs/ft³)

E = Equivalent, ft³/cord volume

$$V = \frac{(19,800 \div 19.5)}{128}$$

$$V = \frac{1015}{128}$$

$$V = 7.9$$

From formula 1, I determined there are 7.9 cords per acre of reserve sound fuelwood contained on fuelwood producing acres on the Fernan District.

Annual Mortality (Recruitment)

Annual recruitment volume calculations were made from stand prognosis models of mortality in unmanaged and managed timber stands developed for the Idaho Panhandle National Forests Management Plan (FOREPLAN). The ft³ volume of recruitment in unmanaged stands by cover type and age class is displayed in Table 13.

Table 13 - Annual Recruitment Volume in Unmanaged Stands by Cover Type and age Class in ft³/Acre/Year

Cover Type	Age Class														
	30	40	50	60	70	80	90	100	110	120	130	140	150	160	Mean
C-H	20	28	40	52	63	74	83	92	97	104	110	116	121	125	80
AF-GF	14	21	33	48	65	83	98	114	125	130	132	132	130	127	89
All Others	6	9	13	19	24	28	32	36	38	41	43	46	46	48	31
Mean	13	19	29	40	51	62	71	81	87	92	95	97	99	100	67

Assumption two is applied in Table 13 to determine the mean annual recruitment of 67 ft³/acre/year on unmanaged fuelwood producing acres on the Fernan District.

The annual recruitment volume in ft³/acre/year is converted to cords/acre/year, including a deduction for rot (assumption 6) using formula 2.

$$\text{Formula 2} \quad V = \frac{(M - R)}{E}$$

Where:

V = Volume, cords/acre/year
M = Recruitment, ft³/acre/year (mean Table 13)
R = Rot, ft³/acre/year (15% mean Table 13)
E = Equivalent, ft³/cord volume

$$V = \frac{(67 - 10.05)}{128}$$

$$V = \frac{56.95}{128}$$

$$V = .4449$$

From formula 2, I determined annual recruitment volume from unmanaged fuelwood producing stands to be .4449 cords/acre/year.

The ft³ volume of recruitment in managed stand by cover type and age class is displayed in Table 14.

Table 14 - Annual Recruitment Volume in Managed Stands by Cover Type and age Class in ft³ /Acre/Year

Cover Type	30	40	50	60	70	80	90	100	110	120	130	140	150	160	Mean
C-H	20	28	40	52	63	53	41	48	55	62	69	75	80	84	55
GF-AF	14	20	33	45	65	67	67	79	87	87	83	76	69	64	61
All Others	6	9	14	20	25	23	70	23	25	27	29	30	31	33	22
Mean	13	19	29	39	51	48	43	50	56	59	60	60	60	60	46

Assumption two is applied in Table 14 to determine the mean annual recruitment of 46 ft³/acre/year on managed fuelwood producing acres on the Fernan District.

Managed stand annual recruitment volume in ft³/acre/year is converted to cords/acre/year, including a deduction for rot (assumption six) and a deduction for salvage of dead and dying (assumption three) using formula 3.

Formula 3
$$V = \frac{M - (R + S)}{E}$$

Where:

V = Volume, cords/acre/year
M = Recruitment, ft³/acre/year (mean Table 14)
R = Rot, ft³/acre/year (15% of mean Table 14)
S = Salvage, ft³/acre/year (2% of mean Table 13)
E = Equivalent, ft³/cord volume

$$V = \frac{46 - (6.9 + 1.34)}{128}$$

$$V = \frac{46 - 8.24}{128}$$

$$V = \frac{37.76}{128}$$

$$V = .2950$$

From formula 3, I determined annual recruitment volume in managed fuelwood producing stands to be .2950 cords/acre/year.

The recruitment volume from unmanaged stands will decrease over the next 20 years as these stands are placed under management (assumption three). I calculated the combined recruitment volume in cords/acre for 1981 using formula 4.

Formula 4
$$V = [(P_1 + P_2) \times V_1] + [(P_3 - P_2) \times V_2]$$

Where:

V = Net recruitment volume, cords/acre/year
P₁ = Stands under management by year, %
P₂ = Stands placed under management by year, %
P₃ = Stands unmanaged by year, %
V₁ = Managed stand recruitment, cords/acre/year (formula 3)
V₂ = Unmanaged stand recruitment, cords/acre/year (formula 2)

Solving for 1981

$$V = [(.50 + .02) \times .2950] + [(.50 - .02) \times .4449]$$

$$V = [.52 \times .2950] + [.48 \times .4449]$$

$$V = .1534 + .2136$$

$$V = .3670$$

Net recruitment volume in cords/acre/year for 1980 through 2000 from fuelwood producing stands are displayed in Table 15.

Table 15 - Recruitment Volume From Managed and Unmanaged Fuelwood Producing Stands in Cords/Acre/Year to the Year 2000

Year	Cords/Acre	Year	Cords/Acre
1980	.3700	1991	.3370
1981	.3670	1992	.3340
1982	.3640	1993	.3310
1983	.3610	1994	.3280
1984	.3580	1995	.3250
1985	.3550	1996	.3220
1986	.3520	1997	.3190
1987	.3490	1998	.3160
1988	.3460	1999	.3130
1989	.3430	2000	.3100
1990	.3400		

The cords/acre of recruitment by year from Table 15 will be used in completing supply projections later in this report.

Fuelwood Supply Areas

The Fernan District was broken into four supply areas based on travel distance from forest entry points (figure 2). The operable acres for fuelwood gathering occurs adjacent to forest roads to which fuelwood gatherers have access. Roads on the District are classified as system and nonsystem with system roads generally being maintained and driveable and nonsystem roads generally require work to make them passable before wood gathering can take place. Calculation of the number of miles of system and non-system roads by supply area was completed using road inventory records for the District. This information is summarized in Table 16.

FERNAN RANGER DISTRICT

Coeur d'Alene National Forest

LEGEND

- | | | | |
|--|--------------------|--|---------------------------------|
| | District Boundary | | Dirt Road |
| | State Boundary | | Primitive Road |
| | County Line | | Trail |
| | Interstate Highway | | Railroad |
| | U. S. Highway | | Ranger Station |
| | State Highway | | Recreation Site, Forest Service |
| | Forest Route | | National Forest Land |

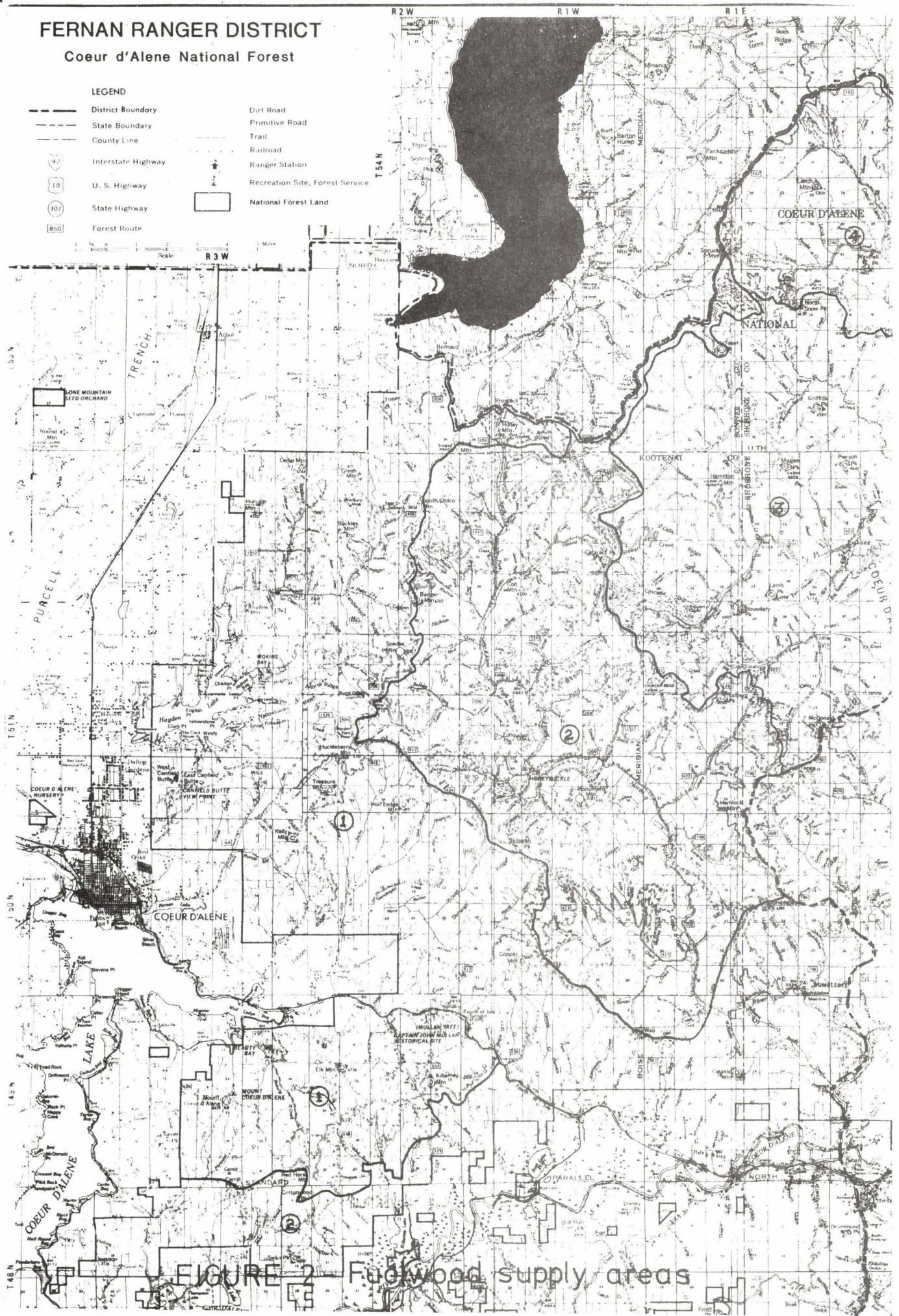


FIGURE 2 Fuelwood supply areas

Table 16 - Miles of System and Nonsystem Roads by Supply Area for the Fernan District

Area	System (Miles)	Nonsystem (Miles)	Total (Miles)
1	440	273	713
2	740	504	1244
3	180	162	342
4	110	89	199
Totals	1470	1028	2498

Roads and the access they provide to fuelwood producing acres is the key to fuelwood supply. There are 354,000 acres of Federal land on the District. Of this 87,757 acres are nonforest, noncommercial, poorly stocked, or immature stands and incapable of producing fuelwood in the next 20 years. There are an estimated 18,000 acres which are producing fuelwood, but inoperable or have been closed to the activity. The inoperable areas are canyons, cliffs and water crossings next to roads and the closed areas are Deception Creek Experimental Forest and lands adjacent to main recreation travel routes with high visual sensitivity and/or safety concerns. My research indicates a typical wood gatherer is willing to walk 270 feet above and 92 feet below roads to collect wood. Research by Dr. Force ^{1/} of the University of Idaho indicates only 18 percent of Idaho wood gatherers are willing to walk more than 300 feet from roads to collect wood. When fuelwood becomes scarce, close-to-roads wood gatherers may be willing to go beyond the 400 foot collection zone used in this report to calculate supply. Management should keep this in mind when developing plans from this data.

Fuelwood Supply Projections

Fuelwood reserve and recruitment supply for the Fernan District are calculated for supply areas by combining data from formula 1 (fuelwood reserve); from Table 15 (fuelwood recruitment); Table 16 (miles of system and nonsystem roads); and assumptions one, four, and five.

This data is used in formula 5 to determine reserve volume by supply area and in formula 6 to determine recruitment volume by supply area.

^{1/} Force, J.E., In press

Formula 5

$$V = [(M \times A) \times P] \times V_1$$

Where:

V = Total volume of reserve, cords

M = Roads in supply area, miles

P = Roads passing through producing acres, percent (.70)

A = Gathering area/mile, acres from assumption five = $(5,280 \times 400) \div 43,560 = 48$

V_1 = Reserve volume, cords/acre (Formula 1)

Solving for system roads in supply area 1.

$$V = [(440 \times 48) \times .70] \times 7.9$$

$$V = [21,120 \times .70] \times 7.9$$

$$V = 14,784 \times 7.9$$

$$V = 116,794$$

The same calculation was made for the remaining system and nonsystem roads in the four supply areas and recorded in Table 17.

Formula 6

$$V = A_1 \times V_2$$

Where:

V = Total volume of recruitment, cords

A_1 = Net gathering area, acres (as determined for each supply area in the calculations made with formula 5)

V_2 = Recruitment volume, cords/acre (formula 4 and Table 15)

Solving for system roads in supply area 1 for the 1980 base year.

$$V = 14,784 \times .3700$$

$$V = 5,470$$

The same calculation was made for the remaining system and nonsystem roads in the four supply areas and recorded in Table 17.

Table 17 - Total Operable Acres and Fuelwood Volume Occurring Along System and Nonsystem Roads on the Fernan District in 1980

Area	System Roads			Nonsystem Roads			Totals	
	Operable (acres)	Reserve (cords)	Recruitment (cords)	Operable (acres)	Reserve (cords)	Recruitment (cords)	(acres)	(cords)
1	14,784	46,718 <u>1/</u>	5,470	9,173	72,467	3,394	23,957	128,049
2	24,864	166,962 <u>1/</u>	9,200	16,934	133,782	6,266	41,798	316,210
3	6,048	47,779	2,238	5,443	43,001	2,014	11,491	95,032
4	<u>3,696</u>	<u>29,198</u>	<u>1,368</u>	<u>2,990</u>	<u>23,624</u>	<u>1,106</u>	<u>6,686</u>	<u>55,296</u>
Total Acres	49,392			34,540			83,932	
Total Cords		290,657	18,276		272,874	12,780		594,587

1/ Reserve cord volumes along system roads in supply areas 1 and 2 have been reduced 60 percent and 15 percent respectively to account for heavy removal in this component over the past 5 years (assumption one).

To quantify total supply to year 2000, individual recruitment calculations were made using volume/acre data (Table 15) in formula 6 for each year and accumulated to the year 2000. These volumes are displayed in Table 18, and will be used to compare with fuelwood demand in the comparison section following.

Table 18 - Total Fuelwood Supply From all Operable Acres Along Roads to the Year 2000

Year	Recruitment <u>1/</u> (cords)	Cumulative (cords)	Year	Recruitment (cords)	Cumulative (cords)
1980	31,056	594,587 <u>2/</u>	1991	28,285	919,571
1981	30,803	625,390	1992	28,033	947,604
1982	30,551	655,941	1993	27,781	975,385
1983	30,299	686,240	1994	27,530	1,002,915
1984	30,048	716,288	1995	27,278	1,030,193
1985	29,796	746,084	1996	27,026	1,057,219
1986	29,544	775,628	1997	26,774	1,083,993
1987	29,292	804,920	1998	26,522	1,110,515
1988	29,040	833,960	1999	26,271	1,136,786
1989	28,789	862,749	2000	26,019	1,162,805
1990	28,537				

1/ Based on 83,932 producing acres for the 20 year period

2/ Includes total reserve volume for base year 1980

Fuelwood Supply and Demand Comparisons

Fuelwood demand and supply estimates to the year 2000 are displayed in figure 3. These curves were plotted from the data contained in Tables 10 and 18 and show demand exceeding supply in 1994.

The variables affecting fuelwood demand and supply were calculated for base year 1980, then held constant for the projected 20 year period. Management should become familiar with these factors to monitor future trends in demand and supply.

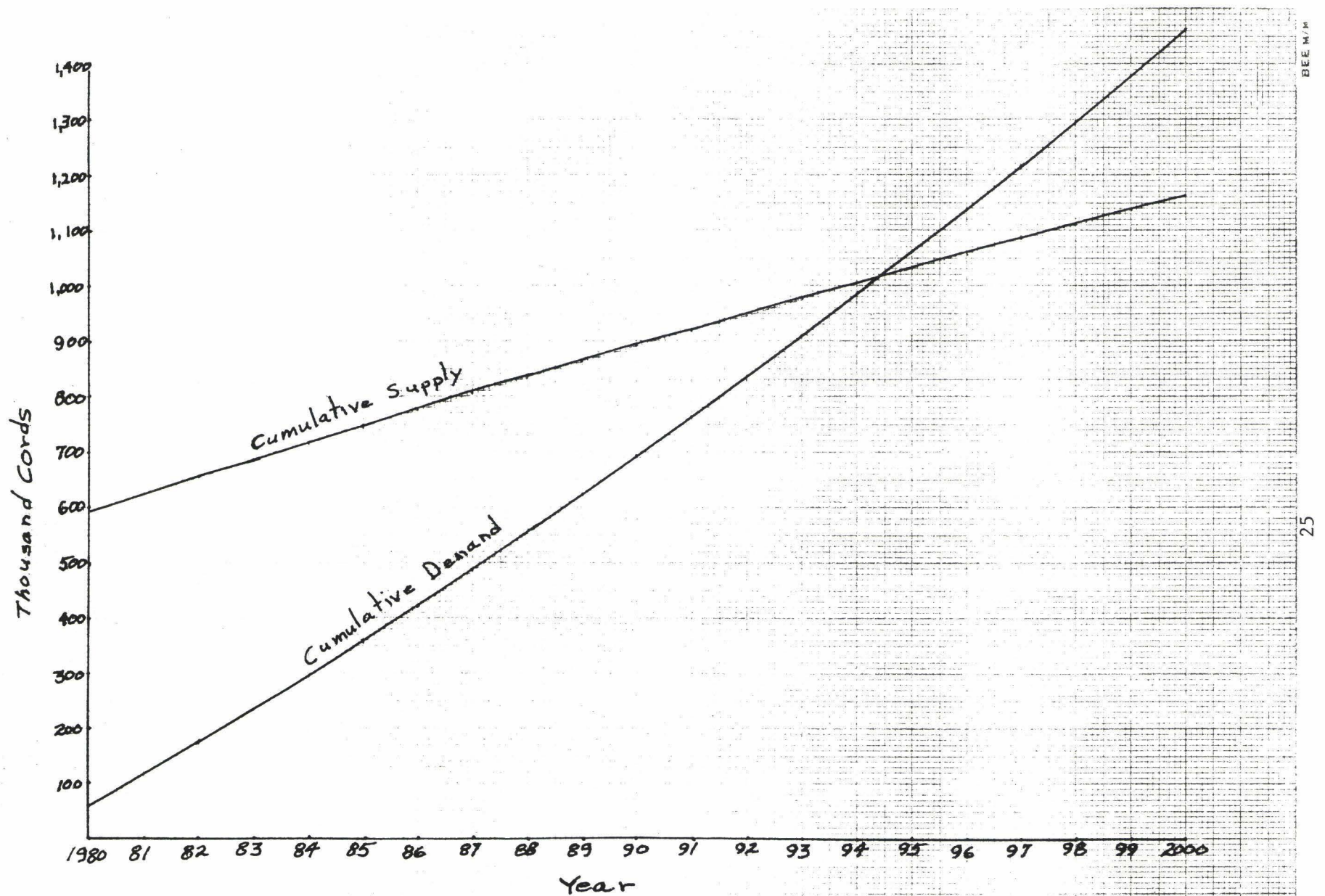


Figure 3 - Cumulative fuelwood demand (table 10) and cumulative fuelwood supply (table 18)

SUMMARY AND CONCLUSIONS

The energy crisis in early 1970 caused some homeowners within the defined regional area (population 412,000 people) to replace or supplement conventional home heating systems with wood burning stoves. Wood gatherers discovered collecting and burning wood was not only economical, but an enjoyable experience and began substituting wood cutting for other more costly forms of recreational activities they were engaged in.

Demand by the public for fuelwood from the Fernan Ranger District has increased 2,360 percent from 399 permits in 1973 to 9,408 permits in 1980. Conservative projections of demand for fuelwood by the general public indicate 11,616 permits will be requested in 1990 and 13,841 permits by 2000.

Regional area permit holders removed an average of 5.8 cords each in 1980 totaling 54,566 cords or 27,283,200 board foot volume. The typical wood gatherer replacing electric heat with wood in the regional area spends from \$258.00 to \$295.00 to collect 5.8 cords of wood and saves from \$248.00 to \$104.00 respectively in heat bills depending on his point of origin. The economic value or dollars expended by the typical woodcutter to collect and burn wood to replace electric heat in 1980 was \$2,549,159 or \$46.72 per cord (\$93.44/ M bd.fts). The utility value of the woodcutting activity is very high with few recreation substitutes at the cost to satisfy the wood gatherer's needs to get physical exercise, be self-reliant, enjoy a family outing, get away from people and to be with friends. The surplus or utility value in dollars saved by the typical woodcutter replacing electric heat with wood in 1980 was \$1,919,346 or \$35.17 per cord (\$70.34/ M bd.ft.).

The recreation activity of woodcutting generated 92,000 RVD's (recreation visitor days) in 1980 and had an economic value of \$27.70/RVD. R-1 is currently using \$3.00/RVD for gathering forest products. Fuelwood cutters are concerned about the decreasing fuelwood supply and illegal woodcutting practices of some woodcutters. They would like to see better maps and signing to help them find wood and stay legal and want the Forest Service to increase its law enforcement activities to stop green wood cutting and the illegal sale of firewood.

Demand for fuelwood permits on the Fernan District stabilized in 1981 with new woodcutters entering the activity balanced by those dropping out. Future demand increases will be proportional to increases in population within the regional area. Cumulating demand to the year 2000 in cords indicates 1,463,000 cords or 731,500,000 board foot volume will be needed from base year 1980 to sustain recreational demand alone to year 2000.

Fuelwood supply on the District is not adequate to sustain projected demand for fuelwood cutters. Other demands for fuelwood in the form of pulp and salvage sales, commercial fuelwood sales and electric generation will make this shortage acute. This situation is further compounded by allocation of wood producing areas to wildlife, fish and recreation use which restricts or eliminates the removal of fuelwood.

Roads and the access they provide to fuelwood producing acres are the key to fuelwood supply. There are 1,470 miles of system and 1,028 miles of nonsystem roads on the District which access 83,932 acres producing fuelwood. Fuelwood occurs as reserve, the dead down and standing sound volume which accumulates over a long period of time and annual mortality which is recruited to the reserve. Reserve volumes are greatest in mature stands peaking at 100-150 years. The removal of reserve volume reduces fuelwood supply for that area to annual mortality. Left undisturbed, reserve volume accumulates rapidly the first twenty years when it averages from 5 to 7 cords per acre. At this point a relative balance is reached between recruitment of sound dead wood and loss to rot.

There is an average of 7.9 cords/acre of reserve fuelwood along roads on the District. Annual recruitment from managed stands is .2950 cords/acre and from unmanaged stands .4449 cords/acre. Total recruitment will decrease as more roadside stands are placed under management to the year 2000. In 1973 there was an estimated 2,100,000 cords of reserve fuelwood on the District. Of this volume, approximately 663,000 cords was accessible to fuelwood gatherers being adjacent to existing roads. Seven years later, this accessible reserve volume had been reduced to 594,587 cords. Projections of demand indicate the accessible reserve volume will be depleted by recreational woodgatherers alone by 1994 and by the year 2000 recreational demand will have exceeded supply by 300,000 cords.

The Fernan District will be severely challenged to manage the recreation activity of fuelwood gathering to the year 2000 in a manner that is responsive to demand with other competing uses and the projected dead fuelwood supply shortage. New and innovative ways to manage this public resource need to be found.

RECOMMENDATIONS

These recommendations are addressed to the Forest Supervisor, Idaho Panhandle National Forest, however, I feel are applicable to the service at large.

- A. .Institute an analysis of all competing demands for fuelwood and develop policy and guidelines for field units to use in planning for and the administration of this resource. The study should include a regional supply/demand analysis of existing and future fuelwood use.
- B. Formulate policy and develop guidelines aimed at increasing fuelwood supply available to consumers. Some alternatives are:
 - 1. Make available to consumers the fuelwood created in clearing road right-of-way for new road construction.
 - 2. Allow consumer collection of fuelwood inside active timber sale areas when not in conflict with contract or active sale activities.
 - 3. Open existing roads that have grown shut or have been closed by the Forest Service for fuelwood collection.
 - 4. Constuct new roads into fuelwood areas.
 - 5. Capitalize on the existing demand for fuelwood to accomplish needed silvicultural work such as sanitation, thinning, site preparation for planting and fuel reduction work by encouraging removal by consumers as fuelwood.
 - 6. Permit removal of green trees for fuelwood.
 - 7. Request funds authorized by Congress through the Wood Residue Utilization Act. PL 96-554-December 19, 1980, to establish pilot projects and demonstrations to develop, demonstrate, and make available information on feasible methods that have potential for commercial application to increase and improve utilization of wood residues resulting from timber havesting and forest protection and management activities.
- C. Include fuelwood supply and demand as a major issue in the development, implementation and revision of the Forest Plan (FORPLAN). This issue has long term implications affecting the management of all other forest resources.
- D. Initiate a monitoring system within FORPLAN to track fuelwood supply and demand for the forest. Management concerns and consumer issues will need to be monitored also.
- E. Institute a charge system to replace the existing Free Use system now in effect. Provision must be made to return a portion of receipts to Districts to offset incurred expenses of administration and road maintenance.

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APPENDIX 1

WOOD GATHERERS PROFILE

Survey results from interviews with 43 recreation wood gatherers on the Fernan District conducted in the fall of 1981. Wood gatherers were classified into two groups, the first from Zone I Coeur d'Alene, Idaho, the second from Zone IV Spokane, Washington. In some cases, percentages sum to more than 100 percent because of two or more answers received for the questions asked. Questions 7, 12, 18, 20, and 21 were hand calculated and no T-Value is displayed. An * beside a T-Value indicates a statistical significant difference is present between the two sample populations at the .05 confidence level.

Question	Response		Mean	T-Value
	(Zone I)	(Zone IV)		
1. How often do you cut firewood? (trips)	7.38	5.70	6.52	-1.75
2. When do you begin cutting wood? (months)	6.38	7.14	6.77	1.64
3. How much wood do you cut? (cords)	6.17	5.39	5.77	-1.13
4. How far have you come? (miles)	21.19	48.64	35.23	8.49*
5. How much further are you willing to go (miles)	21.67	20.00	20.81	- .40
6. Are you willing to pay for wood? (percent yes response)	.67	.73	.70	- .26
7. How much/cord? (\$)	1.16	1.00	1.08	
8. Would you cut green wood if legal? (percent yes response)	.38	.50	.44	.77
9. How far above the road do you go to cut wood? (feet)	282	257	269	- .60
10. How far below the road do you go to cut wood? (feet)	98	86	92	- .23
11. What other recreation activities do you engage in while wood cutting? (percent)				
a. berry picking	.62	.23	.42	-2.77*
b. observing nature	.38	.27	.33	- .74
c. sightseeing	.14	.18	.16	.34
d. enjoying the quiet	0	.09	.05	1.42
e. camping	.24	.09	.16	-1.30
f. drinking beer	0	.09	.05	1.42
g. hunting	.14	.05	.09	-1.09
h. cut wood only	.05	.18	.12	1.37

Question	Response		Mean	T-Value
	(Zone I)	(Zone IV)		
12. What do you enjoy about cutting wood? (percent)				
a. get away from people	.15	.24	.19	
b. the physical exercise	.40	.24	.32	
c. being with my family	.20	.05	.12	
d. being with my friends	.05	.14	.10	
e. being self-reliant and saving money	.20	.33	.27	
13. What species of wood do you prefer? (percent)				
a. fir	.43	.27	.35	-1.06
b. larch	.80	.59	.70	-1.58
c. pine	.05	0	.02	-1.02
d. birch	.09	.05	.07	-.63
e. all species	.14	.41	.28	1.99
14. How do you choose the area to cut wood? (percent)				
a. search for it	.86	.68	.77	-1.36
b. advice from friends	.24	.41	.33	1.19
c. advice from Forest Service	0	.05	.02	.98
d. other	.05	0	.02	-1.02
15. How do you use your wood? (percent)				
a. heating	1.00	.95	.98	-.98
b. cooking	.14	.05	.09	-1.09
c. recreation	.24	.18	.21	-.44
d. other	0	.05	.02	-.98
16. Have you acquired wood from other than National Forest lands? (percent)				
a. private land	0	.05	.02	.98
b. other agency	0	.05	.02	.98
c. industry land	.19	.09	.14	-.93
d. other (purchase)	.19	.18	.19	-.07
17. What would keep you from cutting wood in the future? (percent)				
a. no wood available	.43	.50	.47	.46
b. high cost	.24	.32	.28	.57
c. poor health	.19	.14	.16	-.47
d. nothing	.19	.14	.16	-.47

Question	(Zone I)	(Zone IV)	Mean	T-Value
18. Is the supply of firewood decreasing? (percent)				
a. yes	.90	.68	.79	
b. no	.05	.14	.09	
c. don't know	.05	.18	.12	
19. What is your occupation?				
a. retired	.29	.09	.19	-1.65
b. laborer	.05	.09	.07	
c. professional	.38	.05	.21	-2.90*
d. trade	.19	.77	.48	4.59*
e. other	.09	0	.05	-1.49
20. What would make our firewood program better? (percent)				
a. issue permit only to Idaho residents	.12	0	.06	
b. improve permit maps and signing	.24	.38	.30	
c. improve law enforcement efforts	.12	.12	.12	
d. improve access to wood areas	.24	.12	.18	
e. yard wood to roadside	.18	.19	.19	
f. make green wood available	.05	.06	.06	
g. better communications	.05	.13	.09	
21. What are your concerns? (percent)				
a. too many woodcutters	.33	0	.22	
b. loggers are getting all good wood	.07	.25	.13	
c. illegal cutting and selling wood	.20	.37	.26	
d. not enough law enforcement	.06	.25	.13	
e. poor road maintenance	.07	0	.05	
f. stop logging and building roads	.06	0	.04	
g. sign roads where logging traffic is heavy	.07	0	.04	
h. out of state woodcutters	.13	0	.09	
i. loss of woodcutting program		.13	.04	

APPENDIX 2

COMMUNITIES, POPULATION AND NUMBER OF FREE USE WOOD PERMITS ISSUED BY ZONE WITHIN THE REGIONAL AREA

<u>Travel Zone</u>	<u>Community</u>	<u>Population</u>	<u>No. of Permits Issued</u> <u>1/</u>
I 10 to 20 miles	Coeur d'Alene, ID	20,054	2,522
	Hayden Lake, ID	4,832	742
	Pinehurst, ID	2,183	88
	Athol, ID	812	104
	Bayview, ID	(See Athol)	10
	Harrison, ID	1,260	69
	Medimont, ID	(See Harrison)	10
	Kellogg, ID	3,417	47
	Kingston, ID	500	16
	Cataldo, ID	(See Kingston)	98
	Smelterville, ID	776	22
Zone Total		33,834	3,728
II 20 to 30 miles	Post Falls, ID	15,105	1,177
	Spirit Lake, ID	(See Post Falls)	51
	Rathdrum, ID	(See Post Falls)	385
	Careywood, ID	(See Post Falls)	6
	Hauser Lake, ID	(See Post Falls)	3
	Osburn, ID	1,736	10
	Wallace, ID	2,220	3
Zone Total		19,061	1,635
III 30 to 40 miles	Sagle, ID	1,000	0
	Blanchard, ID	1,000	3
	Worley, ID	500	6
	Liberty Lake, WA	9,205	35
	Newman Lake, WA	(See Liberty Lake)	91
	Greenacres, WA	(See Liberty Lake)	145
	Otis Orchards, WA	(See Liberty Lake)	129
	Veradale, WA	(See Liberty Lake)	174
	St. Maries, ID	3,000	25
	Mullan, ID	1,990	3
	Murray, ID	(See Mullan)	0
Zone Total		16,695	611

1/ The total permits issued to each community was derived by multiplying the percent it represented in the sample times the total number of permits issued.

<u>Travel Zone</u>	<u>Community</u>	<u>Population</u>	<u>No. of Permits Issued 1/</u>
IV 40 to 50 miles	Dishman, WA	106,466	6
	Opportunity, WA	(See Dishman)	10
	Mead, WA	(See Dishman)	44
	Newport, WA	1,665	3
	Valleyford, WA	(See Newport)	10
	Rockford, WA	2,000	6
	Mica, WA	(See Rockford)	16
	Spokane, WA	171,300	3,124
	Priest River, ID	1,639	19
	Hope, ID	106	3
	Clark Fork, ID	449	3
	Sandpoint, ID	4,460	10
	Plummer, ID	900	0
	Zone Total	288,985	3,254
V 50 to 60 miles	Chattaroy, WA	10,099	6
	Waverly, WA	(See Chattaroy)	3
	Colbert, WA	4,995	10
	Elk, WA	(See Colbert)	3
	Fairfield, WA	10,060	10
	Nine Mile Falls, WA	(See Fairfield)	32
	Four Lakes, WA	(See Fairfield)	13
	Airway Heights, WA	(See Fairfield)	13
	Cheney, WA	7,630	25
	Riverside, WA	(See Cheney)	3
	Spangle, WA	431	3
	Zone Total	33,215	121
VI to to 70 miles	Medical Lake, WA	9,954	22
	Deer Park, WA	9,140	10
	Turnbull, WA	1,452	0
	Desmet, ID	200	0
	Zone Total	20,746	32
Outside Regional Area 70 miles +	Wilbur, WA	2/	3
	Monore, WA		3
	Davenport, WA		3
	Othello, WA		3
	Pasco, WA		3
	Clarkston, WA		3
	Ritzville, WA		3
	Moscow, ID		3
	Lewiston, ID		3
Total			27

1/ The total permits issued to each community was derived by multiplying the percent it represented in the sample times the total number of permits issued.

2/ No population figures were recorded beyond the defined regional area.